MATHEMATICS

1. If A is a non-singular matrix and $(A-2I)(A-4I) = \mathbf{[0]}$, then $\frac{1}{6}A + \frac{4}{3}A^{-1}$ is

   A) [0] B) I C) 2I D) 6I

2. The amplitude of the complex number $Z = \frac{-1+i\sqrt{3}}{2}$ is

   A) $\frac{\pi}{6}$ B) $\frac{\pi}{3}$ C) $\frac{2\pi}{3}$ D) $\frac{4\pi}{3}$

3. The eccentricity of ellipse $4x^2 + 9y^2 - 16x = 20$ is

   A) $\frac{\sqrt{5}}{3}$ B) $\frac{2}{3}$ C) $\frac{1}{3}$ D) $\frac{4}{3}$

4. If $\bar{a}$ and $\bar{b}$ are unit vectors and θ is the angle between $\bar{a}$ and $\bar{b}$ then $sin\frac{\theta}{2}$ is equal to

   A) 1 B) $\frac{1}{2}|\bar{a}-\bar{b}|$ C) 0 D) $\frac{1}{2}|\bar{a}+\bar{b}|$

5. The image of the point $(1, 2, 4)$ in the plane $2x - y + z + 2 = 0$ is

   A) $(-3,\ 4,\ 2)$ B) $(3,\ -4,\ 2)$ C) $(-3,\ -4,\ 2)$ D) $(-3,\ 4,\ -2)$

6. $\lim_{x\to 0}[1 + xsin(\pi - x)]^{\frac{1}{x}}$ is equal to

   A) 0 B) e C) 1 D) π

7. $\int_0^{\pi} \log\ (sin^2 x)\, dx = 0$

   A) $2\pi\ log_e(\frac{1}{2})$ B) $2\pi\ log_e(2)$ C) $\pi\ log_e(\frac{1}{2})$ D) $\pi\ log_e(2)$

8. The general solution of the differential equation $2x + \frac{dy}{dx} - y = 3$ at the origin is

   A) $y = 2x - 1$ B) $x^2 + y^2 = 2x - 1$ C) $y = C_1e^x + 2x - 1$ D) $y^2 = C_1e^x + 2x - 1$

9. A die is thrown 100 times. Getting an even number is considered as a success , the variance of number of successes is

   A) 50 B) 25 C) 10 D) 100

10. In the set of integers under the operation $a \times b = a + b - ab$ the identity element is

    A) 0 B) 1 C) a D) b